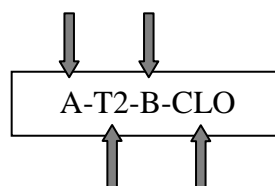
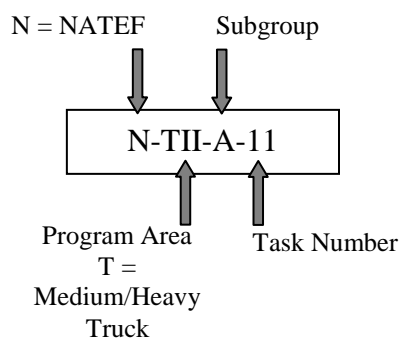


DIESEL: ELECTRICAL/ELECTRONICS

COURSE DESCRIPTION

Diesel: Electronics is a course offering training in the diagnosis and repair of the electrical systems of medium and heavy trucks. Students apply principles of electricity and electronics to diesel technology and develop diagnostic skills. The course provides training in the use of electrical test equipment such as digital multimeters (DMM) and ammeters. Course content prepares students for entry level employment in diesel electrical and electronics, continuing education in diesel technology and post secondary education. Students completing the *Diesel: Electronics* course will be eligible to take the ASE written examination for Electrical and Electronics in Medium/Heavy Trucks.

Prerequisite(s):	Transportation Core Algebra I or Math for Technology II; Physical Science or Principles of Technology I, (may be concurrent)
Required:	A minimum of 210 hours must be dedicated to diesel electrical/electronic systems to meet minimum standards set by NATEF.
Recommended Credits:	2
Number of Competencies:	56 Non-NATEF programs. P-1 (Priority 1) 89 NATEF programs 95% Priority 1 70% Priority 2 25% Priority 3
Recommended Grade Level(s):	10 th , 11 th , or 12 th
Notes:	Course is aligned with NATEF tasks list for medium/heavy trucks. Items have been organized based on the requirements of the state-required course description format. NATEF tasks are referenced with the corresponding Performance Standards. Codes are:



DIESEL: ELECTRICAL/ELECTRONICS

- 1.0** Students will perform safety examinations and maintain safety records.
- 2.0** Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.
- 3.0** Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.
- 4.0** Students will properly test and diagnose general electrical systems.
- 5.0** Students will properly test, diagnose, and repair batteries.
- 6.0** Students will properly test, diagnose, and repair starting system.
- 7.0** Students will properly test, diagnose, and repair charging system.
- 8.0** Students will properly test, diagnose, and repair lighting systems.
- 9.0** Students will properly test, diagnose, and repair gauges and warning devices.
- 10.0** Students will properly test, diagnose, and repair related electrical systems.

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 1.0

Students will perform safety examinations and maintain safety records.

LEARNING EXPECTATIONS

The student will:

- 1.1** Demonstrate a positive attitude regarding safety practices and issues.
- 1.2** Use and inspect personal protective equipment.
- 1.3** Inspect, maintain, and employ safe operating procedures with tools and equipment, such as hand and power tools, ladders, scaffolding, and lifting equipment.
- 1.4** Demonstrate continuous awareness of potential hazards to self and others and respond appropriately.
- 1.5** Assume responsibilities under HazCom (Hazard Communication) regulations.
- 1.6** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies to protect coworkers and bystanders from hazards.
- 1.7** Adhere to responsibilities, regulations, and Occupational Safety & Health Administration (OSHA) policies regarding reporting of accidents and observed hazards, and regarding emergency response procedures.
- 1.8** Demonstrate appropriate related safety procedures.
- 1.9** Pass with 100 % accuracy a written examination relating to safety issues
- 1.10** Pass with 100% accuracy a performance examination relating to safety.
- 1.11** Maintain a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

PERFORMANCE INDICATORS: EVIDENCE STANDARD IS MET

The student:

- 1.1A** Is attentive during safety discussions.
- 1.1B** Actively seeks information about safe procedures.
- 1.1C** Responds positively to instruction, advice, and correction regarding safety issues.
- 1.1D** Does not deliberately create or increase hazards, such as by horseplay, practical jokes, or creating distractions.
- 1.1E** Reports to school or work physically ready to perform to professional standards, such as rested, or not impaired by medications, drugs, alcohol, etc.
- 1.2** Selects, inspects, and uses the correct personal protective equipment for the assigned task.
- 1.3A** Inspects power tools for intact guards, shields, insulation, and other protective devices.
- 1.3B** Inspects extension cords for the presence of a functional ground connection, prior to use.
- 1.3C** Operates and maintains tools in accordance with manufacturer's instructions and as required by regulation or company policy.
- 1.3D** Properly places and secures ladders and scaffolding prior to use.
- 1.4A** Is observant of personnel and activities in the vicinity of the work area.
- 1.4B** Warns nearby personnel, prior to starting potentially hazardous actions.
- 1.5A** When asked to use a new hazardous material, retrieves MSDSs (material safety data sheets), and identifies the health hazards associated with the new material.
- 1.5B** Reports hazards found on the job site to the supervisor.
- 1.6A** Erects shields, barriers, and signage to protect coworkers and bystanders prior to starting potentially hazardous tasks.

- 1.6B** Provides and activates adequate ventilation equipment as required by the task.
- 1.7A** Reports all injuries to self to the immediate supervisor.
- 1.7B** Reports observed unguarded hazards to their immediate supervisor.
- 1.8A** Complies with personal assignments regarding emergency assignments.
- 1.9A** Passes with 100% accuracy a written examination relating specifically to content area.
- 1.10A** Passes with 100% accuracy a performance examination relating specifically to welding tools, equipment and supplies.
- 1.11A** Maintains a portfolio record of written safety examinations and equipment examinations for which the student has passed an operational checkout by the instructor.

SAMPLE PERFORMANCE TASKS

These are sample projects of the type and scale recommended to address one or more of the learning expectations for this standard. Other projects can be used at the instructor's discretion.

- Conduct a practice drill simulating a hazardous solvent spill in which an emergency action plan is to be implemented.
- Instruct a visitor to obviously approach the vicinity of a student conducting a hazardous activity and note the level of awareness demonstrated by the student.
- For a project requiring the use of ladders and/or scaffolding, note the proper placement and securing procedures followed by students.

INTEGRATION LINKAGES

Language Arts, Mathematics, Technical Algebra, Technical Geometry, Algebra, Geometry
English IV: Communication for Life, SkillsUSA Technical Championships, American Welding Society (AWS), Guide for Training and Qualification of Entry Level Welder, National Center for Construction Education Research (NCCER), Secretary's Commission on Achieving Necessary Skills (SCANS), Professional Development Program, SkillsUSA

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 2.0

Students will demonstrate leadership, citizenship, and teamwork skills required for success in the school, community, and workplace.

LEARNING EXPECTATIONS

The student will:

- 2.1** Cultivate positive leadership skills.
- 2.2** Participate in the student organization directly related to their program of study as an integral part of classroom instruction.
- 2.3** Assess situations, apply problem-solving techniques and decision-making skills within the school, community, and workplace.
- 2.4** Participate as a team member in a learning environment.
- 2.5** Respect the opinions, customs, and individual differences of others.
- 2.6** Build personal career development by identifying career interests, strengths, and opportunities.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 2.1A** Demonstrates character and leadership using creative-and critical-thinking skills.
- 2.1B** Uses creative thought process by “thinking outside the box.”
- 2.2A** Relates the creed, purposes, motto, and emblem of their student organization, directly related to personal and professional development.
- 2.2B** Plans and conducts meetings and other business according to accepted rules of parliamentary procedure.
- 2.3A** Makes decisions and assumes responsibilities.
- 2.3B** Analyzes a situation and uses the Professional Development Program or career technical student organization materials directly related to the student’s program of study to resolve it.
- 2.3C** Understands the importance of learning new information for both current and future problem solving and decision making.
- 2.4A** Organizes committees and participates in functions.
- 2.4B** Cooperates with peers to select and organize a community service project.
- 2.5A** Researches different customs and individual differences of others.
- 2.5B** Interacts respectfully with individuals of different cultures, genders, and backgrounds.
- 2.5C** Resolves conflicts and differences to maintain a smooth workflow and classroom environment.
- 2.6A** Creates personal career development by identifying career interests, strengths, and opportunities.
- 2.6B** Identifies opportunities for career development and certification requirements.
- 2.6C** Plans personal educational paths based on available courses and current career goals.
- 2.6D** Creates a resumé that reflects student’s skills, abilities, and interests.

SAMPLE PERFORMANCE TASKS

- Create a leadership inventory and use it to conduct a personal assessment.
- Participate in various career technical student organizations' programs and/or competitive events.
- Implement an annual program of work.
- Prepare a meeting agenda for a specific career technical student organization monthly meeting.
- Attend a professional organization meeting.
- Develop a program of study within their career opportunities.
- Participate in the American Spirit Award competition with SkillsUSA.
- Complete *Professional Development Program Level I and Level II*, SkillsUSA.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program*; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; Technical Math; English IV: Communication for Life; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary's Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 3.0

Students will integrate reading, writing, math, and science skills and understand the impact of academic achievement in the work place.

LEARNING EXPECTATIONS

The student will:

- 3.1** Assume responsibility for accomplishing classroom assignments and workplace goals within accepted time frames.
- 3.2** Develop advanced study skills.
- 3.3** Demonstrate and use written and verbal communication skills.
- 3.4** Read and understand technical documents such as regulations, manuals, reports, forms, graphs, charts, and tables.
- 3.5** Apply the foundations of mathematical principles such as algebra, geometry, and advanced math to solve problems.
- 3.6** Apply basic scientific principles and methods to solve problems and complete tasks.
- 3.7** Understand computer operations and related applications to input, store, retrieve, and output information as it relates to the course.
- 3.8** Research, recognize, and understand the interactions of the environment and *green* issues as they relate to the course work and to a global economy.

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 3.1A** Uses appropriate time management to achieve goals.
- 3.1B** Arrives at school on time each day.
- 3.1C** Completes assignments and meets deadlines.
- 3.2A** Assesses current personal study skills.
- 3.2B** Demonstrates advanced note-taking ability.
- 3.2C** Formulates appropriate study strategies for given tasks.
- 3.3A** Communicates ideas, information, and messages in a logical manner.
- 3.3B** Fills out forms, reports, logs, and documents to comply with class and project requirements.
- 3.4A** Reads and understands technical documents and uses industry jargons, acronyms, and terminology appropriately.
- 3.4B** Recognizes the meaning of specialized words or phrases unique to the career and industry.
- 3.5A** Utilizes computation in adding, subtracting, multiplying, and dividing of whole numbers, fractions, decimals, and percents.
- 3.5B** Chooses the right mathematical method or formula to solve a problem.
- 3.5C** Performs math operations accurately to complete classroom and lab tasks.
- 3.6A** Understands scientific principles critical to the course.
- 3.6B** Applies scientific principles and technology to solve problems and complete tasks.
- 3.6C** Has knowledge of the scientific method (e.g., identifies the problem, collects information, forms opinions, and draws conclusions).
- 3.7A** Uses basic computer hardware (e.g., PCs, printers) and software to perform tasks as required for the course work.
- 3.7B** Understands capabilities of computers and common computer terminology (e.g., program, operating system).

- 3.7C** Applies the appropriate technical solution to complete tasks.
- 3.7D** Inputs data and information accurately for the course requirements.
- 3.8A** Researches and recognizes *green* trends in career area and industry.
- 3.8B** Examines current environmentally-friendly trends.
- 3.8C** Applies sustainability practices by understanding processes that are non-polluting, conserving of energy and natural resources, and economically efficient.

SAMPLE PERFORMANCE TASKS

- Examine and compile different learning styles for portfolios.
- Create calendars containing all activities and obligations for one month. Discusses how to handle conflicting or competing obligations then complete daily and weekly plans showing tasks, priorities, and scheduling.
- Complete self-assessments of study habits.
- Compute precise and exact measurements.
- Explore study strategies for different subjects and tasks then analyze two homework assignments and select the best strategies for completing them.
- Create “life maps” showing necessary steps or “landmarks” along the path to personal, financial, educational, and career goals.
- Take notes during counselor classroom visits and work in small groups to create flow charts of the path options.
- List attitudes that lead to success then rate individually in these areas. Work together to suggest strategies for overcoming the weaknesses identified own and partners’ self-assessments then share with the class the strategies developed.
- Research the Internet and other technology to collect and analyze data concerning climate change.
- Keep a data file of alternative energy sources and the sources’ impact on the environment.
- Develop a recycling project at home or for the school environment.

INTEGRATION LINKAGES

SkillsUSA, *Professional Development Program*; SkillsUSA; Communications and Writing Skills; Teambuilding Skills; Research; Language Arts; Sociology; Psychology; Math; Technical Math; English IV: Communication for Life; Social Studies; Problem Solving; Interpersonal Skills; Employability Skills; Critical-Thinking Skills; Secretary’s Commission on Achieving Necessary Skills (SCANS); Chamber of Commerce; Colleges; Universities; Technology Centers; Secretary’s Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 4.0

Students will properly test and diagnose general electrical systems.

LEARNING EXPECTATIONS

The student will:

- 4.1** Read, interpret, and diagnose electrical/electronic circuits using wiring diagrams. P-1
- 4.2.** Check continuity in electrical/electronic circuits using appropriate test equipment. P-1
- 4.3** Check applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment. P-1
- 4.4** Check current flow in electrical/electronic circuits and components using appropriate test equipment. P-1
- 4.5** Check resistance in electrical/electronic circuits and components using appropriate test equipment. P-1
- 4.6** Locate shorts, grounds, and opens in electrical/electronic circuits. P-1
- 4.7** Identify parasitic (key-off) battery drain problems; perform tests; determine needed action. P-1
- 4.8** Inspect and test fusible links, circuit breakers, relays, solenoids, and fuses; replace as needed. P-1
- 4.9** Inspect and test spike suppression devices; replace as needed. P-3
- 4.10** Check frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment. P-3

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 4.1** Reads, interprets, and diagnoses electrical/electronic circuits using wiring diagrams.
- 4.2** Checks continuity in electrical/electronic circuits using appropriate test equipment.
- 4.3** Checks applied voltages, circuit voltages, and voltage drops in electrical/electronic circuits using appropriate test equipment.
- 4.4** Checks current flow in electrical/electronic circuits and components using appropriate test equipment.
- 4.5** Checks resistance in electrical/electronic circuits and components using appropriate test equipment.
- 4.6** Locates shorts, grounds, and opens in electrical/electronic circuits.
- 4.7** Identify parasitic (key-off) battery drain problems; performs tests; determines needed action.
- 4.8** Inspects and tests fusible links, circuit breakers, relays, solenoids, and fuses; replaces as needed.
- 4.9** Inspects and tests spike suppression devices; replaces as needed.
- 4.10** Checks frequency and pulse width signal in electrical/electronic circuits using appropriate test equipment.

SAMPLE PERFORMANCE TASKS

- Troubleshoot electrical circuits and find cause of problem.
- Correctly diagnose a failed electrical component.
- Use a digital multimeter (DMM) to check the applied voltage in an electrical circuit.
- Use a wiring diagram to diagnose an electrical/electronic circuit.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ ELECTRONICS

STANDARD 5.0

Students will properly test, diagnose, and repair batteries.

LEARNING EXPECTATIONS

The student will:

- 5.1** Perform battery load test; determine needed action. P-1
- 5.2** Determine battery state of charge using an open circuit voltage test. P-1
- 5.3** Inspect, clean, and service battery; replace as needed. P-1
- 5.4** Inspect and clean battery boxes, mounts, and hold downs; repair or replace as needed. P-1
- 5.5** Charge battery using slow or fast method as appropriate. P-1
- 5.6** Inspect, test, and clean battery cables and connectors; repair or replace as needed. P-1
- 5.7** Jump start a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures. P-1
- 5.8** Perform battery capacitance test; determine needed action. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 5.1** Performs battery load test; determines needed action.
- 5.2** Determines battery state of charge using an open circuit voltage test.
- 5.3** Inspects, cleans, and services battery; replaces as needed.
- 5.4** Inspects and cleans battery boxes, mounts, and hold downs; repairs or replaces as needed.
- 5.5** Charges battery using slow or fast method as appropriate.
- 5.6** Inspects, tests, and cleans battery cables and connectors; repairs or replaces as needed.
- 5.7** Jump starts a vehicle using jumper cables and a booster battery or appropriate auxiliary power supply using proper safety procedures.
- 5.8** Performs battery capacitance test; determines needed action.

SAMPLE PERFORMANCE TASKS

- Analyzes the function and operation of the battery.
- Interprets battery ratings and capacity.
- Demonstrates battery safety procedures.
- Demonstrate correct procedure for jump-starting a vehicle.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 6.0

Students will properly test, diagnose, and repair starting systems.

LEARNING EXPECTATIONS

The student will:

- 6.1** Perform starter circuit cranking voltage and voltage drop tests: determine needed action. P-1
- 6.2** Inspect and test components (key switch, push button and/or magnetic) and wires in the starter control circuit; replace as needed. P-2
- 6.3** Inspect and test, starter relays and solenoids/switches; replace as needed. P-2
- 6.4** Remove and replace starter; inspect flywheel ring gear or flex plate. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 6.1** Performs starter circuit cranking voltage and voltage drop tests: determines needed action.
- 6.2** Inspects and tests components (key switch, push button and/or magnetic) and wires in the starter control circuit; replaces as needed.
- 6.3** Inspects and tests, starter relays and solenoids/switches; replaces as needed.
- 6.4** Removes and replaces starter; inspects flywheel ring gear or flex plate.

SAMPLE PERFORMANCE TASKS

- Determine cause of a starter problem and perform needed repair or replacement to solve problem.
- Determine cause of a problem with circuit and cable readings and perform needed repair or replacement to solve problem.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 7.0

Students will properly test, diagnose, and repair charging systems.

LEARNING EXPECTATIONS

The student will:

- 7.1** Test instrument panel mounted volt meters and/or indicator lamps; determine needed action. P-1
- 7.2** Identify causes of a no charge, low charge, or overcharge problems; determine needed action. P-1
- 7.3** Inspect and replace alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjust drive belts and check alignment. P-1
- 7.4** Perform charging system voltage and amperage output tests; perform AC ripple test; determine needed action. P-1
- 7.5** Perform charging circuit voltage drop tests; determine needed action. P-1
- 7.6** Remove and replace alternator. P-2
- 7.7** Inspect, replace, or repair cables, wires, and connectors in the charging circuit. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 7.1** Tests instrument panel mounted volt meters and/or indicator lamps; determines needed action.
- 7.2** Identifies causes of a no charge, low charge, or overcharge problems; determines needed action.
- 7.3** Inspects and replaces alternator drive belts, pulleys, fans, tensioners, and mounting brackets; adjusts drive belts and check alignment.
- 7.4** Performs charging system voltage and amperage output tests; performs AC ripple test; determines needed action.
- 7.5** Performs charging circuit voltage drop tests; determines needed action.
- 7.6** Removes and replaces alternator.
- 7.7** Inspects, replaces, or repairs cables, wires, and connectors in the charging circuit.

SAMPLE PERFORMANCE TASKS

- Determine cause of an alternator problem and perform needed repair or replacement to solve problem.
- Determine cause of a problem using a DMM; interpret readings and perform needed repair or replacement to solve problem.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair.
- Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order.
- Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 8.0

Students will properly test, diagnose, and repair lighting systems.

LEARNING EXPECTATIONS

The student will:

- 8.1** Interface with vehicle's on-board computer; perform diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action. P-1
- 8.2** Identify the causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation. P-1
- 8.3** Test, aim, and replace headlights. P-1
- 8.4** Test headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repair or replace as needed. P-1
- 8.5** Inspect and test switches, bulbs/LEDs, sockets, connectors, terminals, wires, and control components/modules of parking, clearance, and taillight circuits/control modules; repair or replace as needed. P-1
- 8.6** Inspect and test instrument panel light circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. P-2
- 8.7** Inspect and test interior cab light circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. P-2
- 8.8** Inspect and test tractor-to-trailer multi-wire connector(s); repair or replace as needed. P-1
- 8.9** Inspect, test, and adjust stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. P-1
- 8.10** Inspect and test turn signal and hazard circuit flasher(s) switches, relays, bulbs/LEDs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. P-1
- 8.11** Inspect and test reverse lights and warning device circuit, switches, bulbs/LEDs, sockets, connectors, terminals, wires, and control components/modules; repair or replace as needed. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 8.1** Interfaces with vehicle's on-board computer; performs diagnostic procedure using recommended electronic diagnostic equipment and tools (including PC based software and/or data scan tools); determines needed action.
- 8.2** Identifies the causes of brighter than normal, intermittent, dim, or no headlight and daytime running light (DRL) operation.
- 8.3** Tests, aims, and replaces headlights.
- 8.4** Tests headlight and dimmer circuit switches, relays, wires, terminals, connectors, sockets, and control components/modules; repairs or replaces as needed.
- 8.5** Inspects and tests switches, bulbs/LEDs, sockets, connectors, terminals, and wires, and control components/modules of parking, clearance, and taillight circuits/control modules; repairs or replaces as needed.
- 8.6** Inspects and tests instrument panel light circuit switches, bulbs/LEDs, sockets, connectors, terminals, and wires, and control components/modules; repairs or replaces as needed.

- 8.7** Inspects and tests interior cab light circuit switches, bulbs/LEDs, sockets, connectors, terminals, and wires, and control components/modules; repairs or replaces as needed.
- 8.8** Inspects and tests tractor-to-trailer multi-wire connector(s); repairs or replaces as needed.
- 8.9** Inspects, tests, and adjusts stoplight circuit switches, bulbs/LEDs, sockets, connectors, terminals, and wires, and control components/modules; repairs or replaces as needed.
- 8.10** Inspects and tests turn signal and hazard circuit flasher(s) switches, relays, bulbs/LEDs, sockets, connectors, terminals, and wires, and control components/modules; repairs or replaces as needed.
- 8.11** Inspects and tests reverse lights and warning device circuit, switches, bulbs/LEDs, sockets, connectors, terminals, and wires, and control components/modules; repairs or replaces as needed.

SAMPLE PERFORMANCE TASKS

- Determine cause of a headlight problem and perform needed repair or replacement to solve problem.
- Determine cause of a problem with gauge readings and perform needed repair or replacement to solve problem.
- Inspect and test the speedometer and determine if calibration or replacement is required.
- Using case scenarios follow strategy based diagnostic procedure to verify the complaint, define the problem, isolate the problem, validate the problem, make the repair, and test the repair. Complete a repair order using technical writing skills and calculate salary earnings based on the repair order description and manufacture allowances for each item on the work order. Calculate manufacturer labor operation time used in the diagnostic process.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ELECTRONICS

STANDARD 9.0

Students will properly test, diagnose, and repair gauges and warning devices.

LEARNING EXPECTATIONS

The student will:

- 9.1** Interface with vehicle's on-board computer; perform diagnostic procedure using recommended diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action. P-1
- 9.2** Identify causes of intermittent, high, low, or no gauge readings; determine needed action. P-2
- 9.3** Identify causes of data bus-driven gauge malfunctions; determine needed action. P-3
- 9.4** Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repair or replace as needed. P-2
- 9.5** Inspect and test warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets connectors, wires, and control components/modules; repair or replace as needed. P-2
- 9.6** Inspect, test, replace, and calibrate (if applicable) electronic speedometer, odometer, and tachometer. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 9.1** Interfaces with vehicle's on-board computer; perform diagnostic procedure using recommended diagnostic equipment and tools (including PC based software and/or data scan tools); determines needed action.
- 9.2** Identifies causes of intermittent, high, low, or no gauge readings; determines needed action.
- 9.3** Identifies causes of data bus-driven gauge malfunctions; determine needed action.
- 9.4** Inspect and test gauge circuit sensor/sending units, gauges, connectors, terminals, and wires; repairs or replaces as needed.
- 9.5** Inspects and tests warning devices (lights and audible) circuit sensor/sending units, bulbs/LEDs, sockets connectors, wires, and control components/modules; repairs or replaces as needed.
- 9.6** Inspects, tests, replaces, and calibrates (if applicable) electronic speedometer, odometer, and tachometer.

SAMPLE PERFORMANCE TASKS

- Complete a repair order.
- Use reference materials to determine procedures for diagnosing and testing medium and heavy truck electrical and electronic systems.
- Work as a team member to develop a diagnostic strategy.
- Use wiring schematics and diagrams to execute a task.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRICAL/ ELECTRONICS

STANDARD 10.0

Students will properly test, diagnose, and repair related electrical systems.

LEARNING EXPECTATIONS

The student will:

- 10.1** Interface with vehicle's on-board computer; perform diagnostic procedure using recommended diagnostic equipment and tools (including PC based software and/or data scan tools); determine needed action. P-1
- 10.2** Identify causes of constant, intermittent, or no horn operation; determine needed action. P-2
- 10.3** Inspect and test horn circuit relays, horns, switches, connectors, wires, and control components/modules; repair or replace as needed. P-2
- 10.4** Identify causes of constant, intermittent, or no wiper operation; diagnose the cause of wiper speed control and/or park problems; determine needed action. P-2
- 10.5** Inspect and test wiper motor, resistors, park switch, relays, switches, connectors, wires, and control components/modules; repair or replace as needed. P-2
- 10.6** Inspect wiper motor transmission linkage, arms, and blades; adjust or replace as needed. P-2
- 10.7** Inspect and test windshield washer motor or pump/relay assembly, switches, connectors, wires, and control components/modules; repair or replace as needed. P-2
- 10.8** Inspect and test side view mirror motors, heater circuits grids, relays, switches, connectors, wires, and control components/modules; repair or replace as needed. P-2
- 10.9** Inspect and test heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, wires, and control components/modules; repair or replace as needed. P-2
- 10.10** Inspect and test auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repair or replace as needed. P-3
- 10.11** Identify causes of slow, intermittent, or no power side window operation; determine needed action. P-3
- 10.12** Inspect and test motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repair or replace as needed. P-2
- 10.13** Inspect and test block heaters; determine needed repairs. P-2
- 10.14** Inspect and test cruise control electrical components; repair or replace as needed. P-3
- 10.15** Inspect and test switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits. P3
- 10.16** Check operation of keyless and remote lock/unlock devices; determine needed action. P-3
- 10.17** Inspect and test engine cooling fan electrical control components/modules; repair or replace as needed. P-2
- 10.18** Identify causes of data bus communication problems; determine needed action. P-2

PERFORMANCE STANDARDS: EVIDENCE STANDARD IS MET

The student:

- 10.1** Interfaces with vehicle's on-board computer; performs diagnostic procedure using recommended diagnostic equipment and tools (including PC based software and/or data scan tools); determines needed action. P-1

- 10.2** Identifies causes of constant, intermittent, or no horn operation; determines needed action.
- 10.3** Inspects and tests horn circuit relays, horns, switches, connectors, wires, and control components/modules; repairs or replaces as needed.
- 10.4** Identifies causes of constant, intermittent, or no wiper operation; diagnoses the cause of wiper speed control and/or park problems; determines needed action.
- 10.5** Inspects and tests wiper motor, resistors, park switch, relays, switches, connectors, wires, and control components/modules; repairs or replaces as needed.
- 10.6** Inspects wiper motor transmission linkage, arms, and blades; adjusts or replaces as needed.
- 10.7** Inspects and tests windshield washer motor or pump/relay assembly, switches, connectors, wires, and control components/modules; repairs or replaces as needed.
- 10.8** Inspects and tests side view mirror motors, heater circuits grids, relays, switches, connectors, wires, and control components/modules; repairs or replaces as needed.
- 10.9** Inspects and tests heater and A/C electrical components including: A/C clutches, motors, resistors, relays, switches, connectors, wires, and control components/modules; repairs or replaces as needed.
- 10.10** Inspects and tests auxiliary power outlet, integral fuse, connectors, terminals, wires, and control components/modules; repairs or replaces as needed.
- 10.11** Identifies causes of slow, intermittent, or no power side window operation; determines needed action.
- 10.12** Inspects and tests motors, switches, relays, connectors, terminals, wires, and control components/modules of power side window circuits; repairs or replaces as needed.
- 10.13** Inspects and tests block heaters; determines needed repairs.
- 10.14** Inspects and tests cruise control electrical components; repairs or replaces as needed.
- 10.15** Inspects and tests switches, relays, controllers, actuator/solenoids, connectors, terminals, and wires of electric door lock circuits.
- 10.16** Checks operation of keyless and remote lock/unlock devices; determines needed action.
- 10.17** Inspects and tests engine cooling fan electrical control components/modules; repairs or replaces as needed.
- 10.18** Identifies causes of data bus communication problems; determines needed action.

SAMPLE PERFORMANCE TASKS

- Complete a repair order.
- Use reference materials to determine procedures for diagnosing and testing medium and heavy truck electrical and electronic systems.
- Work as a team member to develop a diagnostic strategy.
- Use wiring schematics and diagrams to execute a task.

INTEGRATION LINKAGES

Science, Math, Math for Technology, Technology Literacy, Applied Communications, Problem-Solving, National Institute for Automotive Service Excellence (ASE), National Automotive Technician Education Foundation (NATEF), Occupational Safety and Health Administration (OSHA), Tennessee Safety and Health Administration (TOSHA), Environmental Protection Agency (EPA), Secretary's Commission on Achieving Necessary Skills (SCANS)

DIESEL: ELECTRONICS

SAMPLING OF AVAILABLE RESOURCES

T6 Electrical And Electronics Curriculum Module, AYES Corporation, www.ayes.org

2001 Medium/Heavy Duty Truck Task List, National Automotive Technicians Education Foundation (NATEF)

Diesel Technology: Workplace Skills, Instructional Materials Laboratory (IML), University of Missouri

Diesel Technology: Safety Skills, Instructional Materials Laboratory (IML), University of Missouri

Curriculum Integrator, CORD Communications, Waco, Texas 1998

Diesel Technology, Goodheart-Willcox, 2001